# PROGRIS RIPORT 16

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010416

itehu:~kotani/glast/txt/010416.kotani2.riport16

## 1 Have Done

- Found that the track of some 300 GeV electron events is not well reconstructed and thus they are not cut.

## 2 Follow Comrade Stakhanov

The ratio of accepted 300 GeV electron events to accepted 300 GeV photon events under the current filter set is shown in Table 1. The rejection ratio achieved so far does not meet the expectation, although it has been improved Riport by Riport. I will show this table in every Riport until the goal is achieved. The day is near if we work hard.

Table 1: The bottom-line BGD rejection ratio at 300 GeV

| | Today | Goal |
|---|---|---|
| [Remaining e]/[Remaining $\gamma$] | $0.0070/0.28 = 0.025$ | $10^{-4}$ |

## 3 The Best Track is not always the Best

In previous Riports, the initial-vertex filter has been introduced. However, it doesn't cut some electrons, and 10 % of L1-triggering events survives the filter. That's disappointing. The nature of the remaining events is investigated.

An example of such remaining events is shown in Fig. 1. It's recognizable by eye (if you try hard) that the best track starts from the 2nd layer, i.e., the initial vertex is at the 2nd layer, although the incident electron makes a signal at the first layer. Therefore, the the initial-vertex filter can not distinguish this event from photon events and keeps it. Roughly, half of the remaining events is caused by this kind of "wrong reconstruction." The other half is due to electrons sneaking between tracker towers, and to be removed by improving the logic of the initial-vertex filter. The improvement is on the way. If both types are successfully cut, the BGD rejection ratio at 300 GeV will be improved by at least one order, i think.

Why is the signal at the 1st layer in Fig. 1 neglected by the track-search algorithm? I don't know. The signal at the 1st layer seems to be well aligned to other signals, and it is probably no problem to include the 1st signal into the fitting. Because the algorithm searches a track from the 1st layer, there is no reason to miss the signal at the 1st layer. Do i understand correctly?

So i'm studying on the track-search algorithm. Is the algorithm coded in GLASTSIM used also in the TkrRecon in Gaudi and in the GLASTSIM G4? Is it a tradition to code without documenting and leave the software team?

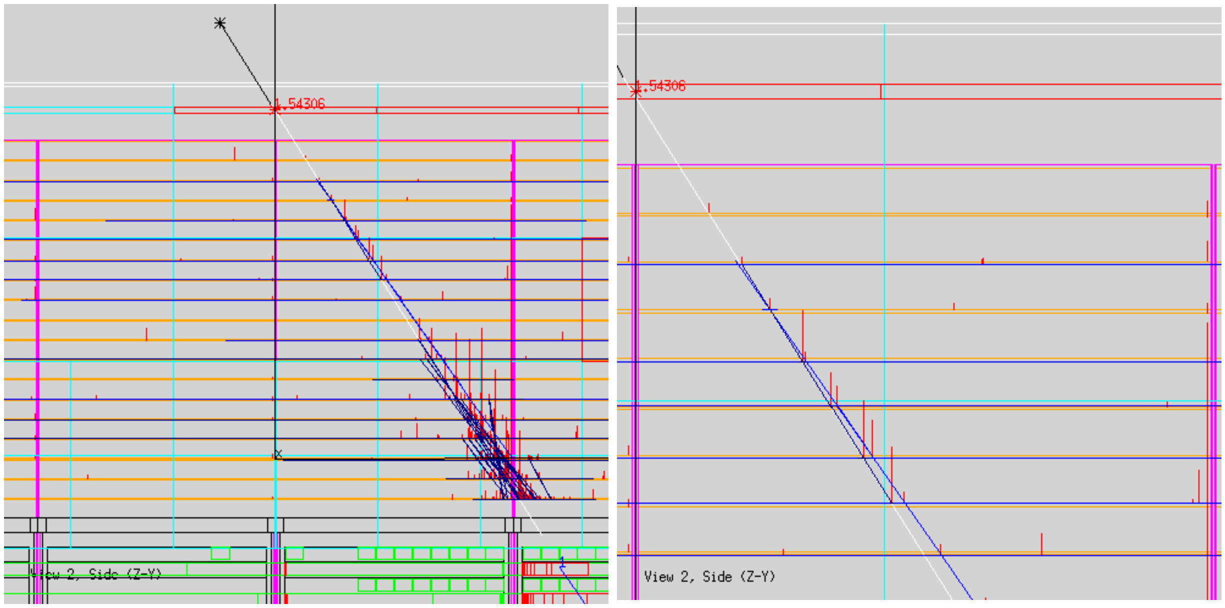


Figure 1: A bad best track
An incident electron from top makes a signal at each layer. The reconstructed best track (solid line) starts from the 2nd layer. The signal at the 1st layer is somehow ignored. The right panel is a low up of the left.

## 4 Comparison with a Simple Veto

We can veto an event if the ACD tile on the extrapolation line of the best track is lit. I think i was told that this simple veto is not good and not to be used but don't remember why. (Why is it bad? Because it cuts incident photons lighting a tile by Comptonization? Do we have to keep a photon Comptonizing a tile? Please tell me.) Anyway i have tested the simple veto, and found that at this stage it is not so bad compared with the current initial-vertex filter, which keeps many electron events as shown above. The two filters are compared in Table 2 and 3. The simple veto is superior to the initial-vertex filter by one order of magnitude. If we don't use the simple veto, we must improve the initial-vertex filter by at least one order.

## 5 To Do

- Look up the code of the track-search algorithm to see what's going on.

Table 2: The effect of the initial-vertex filter

The top of the GLAST is illuminated with 300 GeV photons and electrons. The filter set including the initial-vertex filter is applied. [Remaining e]/[Remaining $\gamma$] = 0.025 is achieved. This number will be improved by modifying the logic of the initial-vertex filter and by adopting a new track-search algorithm. For definition of each filter, see Table 1 in Riport 15.

| | $\gamma$ | | e | |
|---|---|---|---|---|
| Generated | 1 | 8000 | 1 | 8000 |
| L1T | $(5.859 \pm 0.086) \times 10^{-1}$ | 4687 | $(7.624 \pm 0.098) \times 10^{-1}$ | 6099 |
| L2T | $(5.176 \pm 0.080) \times 10^{-1}$ | 4141 | $(5.676 \pm 0.084) \times 10^{-1}$ | 4541 |
| New L3T | $(4.170 \pm 0.072) \times 10^{-1}$ | 3336 | $(4.251 \pm 0.073) \times 10^{-1}$ | 3401 |
| Hi CAL | $(3.960 \pm 0.070) \times 10^{-1}$ | 3168 | $(4.251 \pm 0.073) \times 10^{-1}$ | 3401 |
| Best Track | $(3.043 \pm 0.062) \times 10^{-1}$ | 2434 | $(4.251 \pm 0.073) \times 10^{-1}$ | 3401 |
| Initial Vertex 0 | $(2.938 \pm 0.061) \times 10^{-1}$ | 2350 | $(9.26 \pm 0.34) \times 10^{-2}$ | 741 |
| 1 | $(2.930 \pm 0.061) \times 10^{-1}$ | 2344 | $(8.94 \pm 0.33) \times 10^{-2}$ | 715 |
| 2 | $(2.854 \pm 0.060) \times 10^{-1}$ | 2283 | $(8.0 \pm 1.0) \times 10^{-3}$ | 64 |
| Majority Veto | $(2.784 \pm 0.059) \times 10^{-1}$ | 2227 | $(7.00 \pm 0.94) \times 10^{-3}$ | 56 |

Table 3: The effect of the simple veto

The top of the GLAST is illuminated with 300 GeV photons and electrons. The filter set including the simple veto is applied. [Remaining e]/[Remaining $\gamma$] = 0.0023 (wow!) is achieved.

*Simple Veto: Cut the event if the tile on the extrapolation of the best track is lit.*

| | $\gamma$ | | e | |
|---|---|---|---|---|
| Generated | 1 | 8000 | 1 | 8000 |
| L1T | $(5.859 \pm 0.086) \times 10^{-1}$ | 4687 | $(7.624 \pm 0.098) \times 10^{-1}$ | 6099 |
| L2T | $(5.176 \pm 0.080) \times 10^{-1}$ | 4141 | $(5.676 \pm 0.084) \times 10^{-1}$ | 4541 |
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| Hi CAL | $(3.960 \pm 0.070) \times 10^{-1}$ | 3168 | $(4.251 \pm 0.073) \times 10^{-1}$ | 3401 |
| Best Track | $(3.043 \pm 0.062) \times 10^{-1}$ | 2434 | $(4.251 \pm 0.073) \times 10^{-1}$ | 3401 |
| Simple Veto | $(2.770 \pm 0.059) \times 10^{-1}$ | 2216 | $(7.5 \pm 3.1) \times 10^{-4}$ | 6 |
| Majority Veto | $(2.701 \pm 0.058) \times 10^{-1}$ | 2161 | $(6.2 \pm 2.8) \times 10^{-4}$ | 5 |